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(54) COMPRESSED GAS DRYER ASSEMBLY

(71) We, GALINDALE LIMITED, a British company, of Gordon Road, Fareham, Hampshire, England, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to compressed gas dryer assemblies.

It is well known that compressed air can be used for example for paint spraying, blow guns, and similar uses. However, compressed air is now also widely used as a power means for actuating various forms of tools, and also for providing a control function. To give satisfactory operation, it is necessary for the compressed air to be dry and free from contamination.

According to the present invention, there is provided a compressed gas dryer assembly comprising: a dryer unit including a first chamber, a compressed gas inlet into the first chamber, means for spinning the inflowing gas as it passes through the first chamber, a second chamber disposed within the first chamber and having a communication with the first chamber at a position spaced from said inlet, a gas outlet from the second chamber at a position spaced from said communication with the first chamber, such that, in operation, gas flows from the inlet in succession through the first and second chambers to the outlet, and a third chamber in heat-exchange relation with the first chamber; and a refrigeration unit, said third chamber forming the evaporation chamber of the refrigeration unit whereby the refrigerant in said third chamber cools the spinning gas in the first chamber.

A compressed gas dryer assembly according to the present invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a view in cross-section of a compressed gas dryer unit forming part of the assembly.

Figure 2 is a diagrammatic view of the compressed gas dryer assembly including the unit of Figure 1.

Referring firstly to Figure 1, a compressed gas dryer assembly includes a compressed air dryer unit comprising a first chamber formed by a tube member 1 which in use is arranged vertically. Disposed within the first chamber 1 substantially coaxially therewith is a second chamber formed by a tube member 2. The lower end of the tube member 2 is open to provide a communication between the two tube members 1 and 2 for compressed gas such as air to be dried. A third chamber is in heat-exchange relation with the chamber 1; as shown the third chamber is in the form of a jacket tube 3 enclosing a substantial part of the length of the tube member 1; further reference to this third chamber will be made below.

The compressed gas dryer unit also has an inlet connection 4 for the gas to be dried, and an outlet connection 5 for discharge of the dried gas. As is clearly visible in Figure 1, the walls of the tube member 2 and the inlet and outlet connections 4 and 5 are so arranged that the inlet connection 4 opens only into the tube member 1, and the interior of the tube 2 is in communication only with the outlet connection 5, while the communication between the two chambers 1 and 2 is spaced from both the inlet 4 and the outlet 5.

Disposed in the tube member 1 adjacent its upper end is a means 6 for imparting to the gas flowing from the inlet connection 4 into the tube member 1, a rotary movement about the tube member 2. The flow path of the gases is indicated by the arrows around the tube member 2. The means 6 can be for example inclined vanes or blades, or inclined nozzle members.

It will be noted from Figure 1 that the lower end of the tube member 2 is slightly

flared in a downward direction, to facilitate the entry of the rotating gases into the tube member 2, while the lower end of the tube member 2 also terminates short of the bottom of the tube member 1. The space between the lower end of the tube member 2 and the bottom of the tube member 1 thus forms a moisture trap 7 with a drain plug 8.

Referring now also to Figure 2, the compressed gas dryer of Figure 1 is part of a compressed gas dryer assembly, by the jacket tube being connected adjacent its upper end to a compressor 9 which in turn is connected to a condenser 10 cooled by a fan 11. The condenser 10 is in turn connected to a liquid receiver 12, the outlet of which is connected by way of a thermostatic expansion valve 13 to the jacket tube 3 adjacent the lower end thereof. A constant pressure valve 14 is provided in a branch line connected between the line joining the jacket tube 3 to the compressor 9, and the line joining the compressor 9 to the condenser 10. It will be seen therefore that the jacket tube 3 forms an evaporator or expansion chamber in which refrigerant from the valve 13 evaporates, for direct-expansion cooling of the dryer unit jacket tube thereby to cool gas flowing through the chamber 1.

Operation of the above-described compressed gas dryer assembly is as follows:

The jacket tube 3 is cooled by operation of the refrigeration unit comprising the components 9 to 14 of Figure 2. Compressed gas (air) which is to be dried is passed by way of the inlet communication 4 into the tube member 1. As the inflowing gas passes through the means 6 the gas is caused to rotate about the tube member 2 as the gas flows in the downward direction in Figure 1. When the downwardly flowing and spinning gas reaches the lower end of the tube member 2, it enters the tube member 2 and flows upwardly therein, and is then discharged from the dryer unit by way of the outlet connection 5.

As the gas is spun in the tube member 1, it comes into direct heat-exchange contact with the inside surface of the peripheral wall of the tube member 1, which wall is substantially cooled by the refrigerant in the jacket tube 3. As a result of this heat-exchange contact, the temperature of the compressed gas flowing in the tube member 1 is reduced, which causes water vapour entrained in the gas flow to be condensed out. The condensate collects in the trap 7 for subsequent removal from time to time.

The operating capacity of the dryer unit can be adjusted according to the dewpoint required. The unit is substantially self-contained, and in operation is simply connected into a compressed gas flow circuit downstream of the gas compressor.

The dryer assembly can also have thermostatic control means to control the degree of cooling of the gas, for example by controlling operation of the refrigeration unit.

WHAT WE CLAIM IS:—

1. A compressed gas dryer assembly comprising: a dryer unit including a first chamber, a compressed gas inlet into the first chamber, means for spinning the inflowing gas as it passes through the first chamber, a second chamber disposed within the first chamber and having a communication with the first chamber at a position spaced from said inlet, a gas outlet from the second chamber at a position spaced from said communication with the first chamber, such that, in operation, gas flows from the inlet in succession through the first and second chambers to the outlet, and a third chamber in heat-exchange relation with the first chamber; and a refrigeration unit, said third chamber forming the evaporation chamber of the refrigeration unit whereby the refrigerant in said third chamber cools the spinning gas in the first chamber.

2. An assembly according to claim 1 wherein the first chamber and the second chamber each comprise a tube member.

3. An assembly according to claim 2 wherein the tube member forming the second chamber is disposed substantially coaxially within the tube member forming the first chamber.

4. An assembly according to claim 2 or claim 3 wherein said evaporation chamber comprises a jacket tube enclosing a substantial part of the first chamber.

5. An assembly according to any one of the preceding claims wherein said means for spinning the inflowing gas comprises a blade or vane arrangement.

6. An assembly according to claim 2 or any claim appendant thereto wherein said tube members are substantially vertical in the position of operation of the unit, and a moisture trap is arranged at the lower end of the tube member forming the first chamber.

7. A compressed gas dryer assembly substantially as hereinbefore described with reference to Figures 1 and 2 of the accompanying drawings.

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Sheet 2

FIG. 2.